

A NEW SPECIES OF CASTILLEJA
FROM THE SOUTHERN SIERRA NEVADA

LAWRENCE R. HECKARD and RIMO BACIGALUPI

Castilleja praeterita, Heckard and Bacigalupi, sp. nov. (fig. 1, a-h). Planta perennis omnino praesertim insuper septatim villosa-hirsuta, caulibus costato-angulatis 1–3.5 dm altis, insuper adscendente ramosis plerumque pluribus ex radice lignosa arcuato-adscendentibus. Folia 3–5 cm longa, linearia vel lineari-lanceolata, obtusa vel acuminata, superiora in lobis duobus (interdum 4) angustissimis adscendentibus dissecta. Inflorescentia angusta, conferta, villosa glanduloso-puberulentaque, 1.5–2 cm lata, demum 8–14 cm longa, bracteis eius plerumque 1.5–2 cm longis, 5–8 mm latis, parte centrali oblonga, ad basem versus paulo angustata, ad apicem truncato-rotundatum versus sensim latescente, lobis lateralibus plerumque duobus angustatis adscendentibusque apice rotundatis ex medio instructa. Calyx 14–18 mm longus, plus minusve quadrangularis, sagittaliter aequaliterque 7–11 mm fissus, lobis terminalibus duobus in quoque latere 0.5–2 mm longis, acutis vel rotundatis, quam latis paulo longioribus. Corolla 13–16 mm longa, calyci plus minusve aequilonga vel paulo exserta, galea ca. 1.5 mm longa, dorso minute puberulenta, labio inferiore ca. 1.5 mm longo, sacculis tribus angustis conniventibus, apice brevissime in lobulis involutis apiculatisque ca. 0.5 mm longis terminantibus instructo. Inflorescentiae quod ad colorem attinet bimodales: bractee calycesque aut pallide virides, ad apices versus citrini, galeae dorso viridis membranibus lateralibus stramineis; aut ei glaucescentes, ad apices versus lateriti vel plerumque ei omnino pallide phoenicei, galeae membranibus lateralibus violaceo-porphyreis.

Perennial with one to several (to 15) arcuate-ascending annual costate-angulate stems arising from a woody root-crown. Stems 1–3.5 dm tall, occasionally with subordinate ascending branches arising mostly above their mid-points. Stems and leaves villous-hirsute with septate trichomes throughout, occasionally with some inconspicuous glandular trichomes, becoming increasingly villous just below and in the inflorescence. Leaves 3–5 cm long and 2–5 mm broad, linear to linear-lanceolate or narrowly oblong, blunt or attenuate to a pointed tip, the lower entire and nearly petioleless, the upper sessile, broadened below a pair (rarely 2 pairs) of much narrower, divergent or ascending lobes. Inflorescence villous and glandular-puberulent, dense and narrow, 1.5–2 cm broad, becoming 8–14 cm long, the bracts and calyces scaberulous towards the tips. Bracts shorter and broader than the upper leaves, 15–20 (to 25) mm long, 5–8 mm broad, with a pair (rarely 2 pairs) of narrow lobes with rounded or apiculate apices ascending from near the middle, the much broader central lobe oblong but slightly narrowed be-

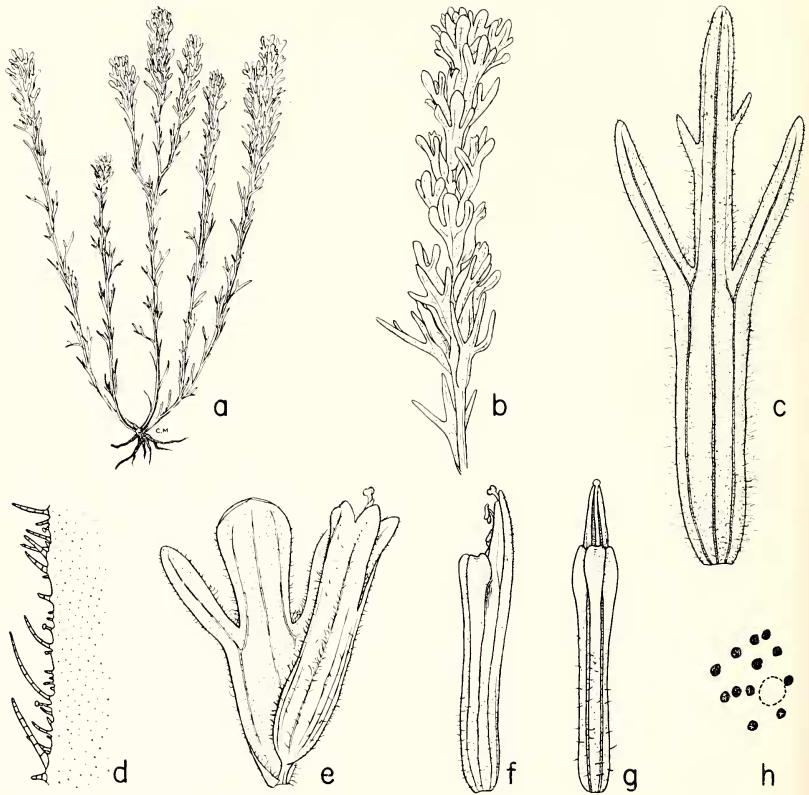


FIG. 1, *Castilleja praeterita*: a, habit, $\times \frac{1}{6}$; b, inflorescence, $\times \frac{1}{2}$; leaf, $\times 2$; d, detail of bract margin, $\times 10$; e, bract and flower, $\times 2$; f, corolla, side view, $\times 2$; g, corolla, front view, $\times 2$; h, chromosomes, $n = 12$, prophase II, $\times 800$ (Bacigalupi & Heckard 9213). Drawings a-g are from the type collection, Bacigalupi & Heckard 9190.

low and with a broadened truncate or truncately rounded distal portion. Pedicels 1–2 mm long. Calyx 14–18 mm long, somewhat quadrangulate, the corners formed by four major veins, cleft medianly 7–11 mm, laterally 0.5–2 mm into lobes which are a little longer than broad and either pointed or rounded and sometimes apiculate. Corolla 13–16 mm long, included or exerted 1–2 mm beyond the calyx, its tube glabrous or sparsely pilose (the trichomes sometimes gland-tipped) along the ventral and lateral surfaces, its galea ca. 5 mm long, minutely puberulent along the back, its lower lip ca. 1.5 mm long, formed of 3 narrow pouches, the outer folds of which are connivent and each of which terminates in an inconspicuous incurving hooded and apiculate lobe. Inflorescence of two color-forms: (1) bracts and calyces pale green and tipped with lemon yellow, the corolla with the membranous lateral flaps of the galea yellowish white; (2) bracts and calyces grayish green and tipped with pale

brick red, or often pale reddish with anthocyanin pigment throughout, the corollas with the lateral flaps of the galea maroon-purple; the back of the galea and lower lip green in both forms but the lower lip of the second color-form often suffused with dull purple. Anther-pairs sparsely pilose along the dehisced margins, connivent at anthesis and forming a tier in the opening between the lateral margins of the galea, later separating, the dimorphic anther-cells of the upper anther-pair ca. 1.5–2 mm and 1.0–1.5 mm long respectively, the lower anther-pair with the corresponding cells ca. 0.3 mm shorter. Stigma capitate but very shallowly bilobed, a little over 0.5 mm broad, protruding 0–2 mm beyond the galea at anthesis. Ovary cylindrical-ovoid, 2–2.5 mm long, maturing into a many-seeded capsule ca. 8–10 mm long. Seeds 1–1.5 mm long and 0.75 mm broad, variously angled, with a tan, reticulate outer testa. Chromosome number: $n = 12$.

Type. *Bacigalupi & Heckard 9190*, northern edge of Horse Meadow on Salmon Creek, about 7 air miles east southeast of Fairview, southern Sierra Nevada, Tulare Co., California, elevation 7400 ft., Aug. 10, 1966, $n = 12$ (JEPS-holotype; isotypes to be distributed).

Other representative specimens (UC or JEPS unless otherwise indicated): Tulare Co.: Big (Brown) Meadow, ca. 3 miles southeast of Horse Meadow, *Bacigalupi & Heckard 9206* (chromosome voucher: $n = 12$); Monache Meadows, *Munz 15067* (RSA); Bakeoven Meadows, *Howell 26764* (CAS, DS); southwest of Templeton Meadow, *C. N. Smith 1515*; Tunnel to Ramshaw Meadow, *Howell 25909* (CAS, UC); Little Whitney Meadow, *Ferris & Lorraine 10779*; Cottonwood Pass, *Peirson*, Aug. 8, 1911; north of Crabtree Meadows, *Raven 7594*; below Timberline Lake, *Robbins 3623*. Inyo Co.: Horseshoe Meadow, *Bacigalupi & Heckard 9212* (chromosome voucher: $n = 12$); above Cottonwood Sawmill, canyon of Cottonwood Creek, *Bacigalupi & Heckard 9213* (chromosome voucher: $n = 12$); Cottonwood Lakes, *Alexander & Kellogg 3315*.

The specific name of this species comes from the Latin word, *praeterita*, meaning overlooked, neglected, or passed by without notice.

Usually associated with and probably parasitic on the roots of *Artemisia rothrockii* and, less frequently, with *Artemisia tridentata* (*Bacigalupi 9213*); dryish, sandy or rocky slopes, commonly bordering meadows; in areas of *Pinus contorta* ssp. *murrayana*; elevation 7,400–11,000 ft.

It will be seen that the cited specimens fall into two groups—a southern one which includes the type of the species, and a more northerly one—between which there is a gap of approximately 24 air miles. Whether this interval represents an actual gap in distribution or merely reflects minimal collecting in this area is conjectural.

There are some morphological differences between the northern and southern populations of *C. praeterita*. The two southern populations (Big, formerly Brown, Meadow and Horse Meadow) consistently have

the yellow inflorescence with yellow-tipped bracts and calyces rather than the pale brick red inflorescence which predominates in northern populations. There is also a tendency in these southern populations for the plants to be larger in all respects, including bracts and floral parts. Especially noticeable is the broader inflorescence. Chromosome counts indicate that these differences are not related to level of polyploidy as samples both from southern populations and from two of the northern populations all proved to be diploid.

Although collections of this species have been accumulating in herbaria over the past seventy years, they have either remained unidentified or have been incorrectly referred to *Castilleja pilosa* (Wats.) Rydb. The superficial resemblance to *C. pilosa* may be attributed to similarities in habit, foliage, and indument. *Castilleja pilosa* is sharply differentiated from *C. praeterita*, however, by its calyx, which is more or less equally 4-cleft rather than relatively deeply slit only in its sagittal plane, as in most castillejas. The 4-cleft calyx has been used by some taxonomists (Watson, 1871; Gray, 1878; Jepson, 1925) as a basis for referring *C. pilosa* and closely related species to *Orthocarpus*.

Judging from the absence of annotations on collections of *C. praeterita* in California herbaria (CAS, DS, JEPS, RSA, UC), it would seem that Pennell never saw specimens of our new species. Had he done so, he doubtless would have devised a scheme of subgeneric subdivisions very different from the one he proposed in 1951. *Castilleja praeterita* has a lower lip somewhat pouched but less than half the length of the galea, a combination of characters which precludes its inclusion in any of the 19 sections proposed by Pennell (1951) or as modified by Ownbey (1959). The nearest affinity would seem to be with sections *Chrysanthae* and *Pallescentes*, but the teeth of the lower corolla-lip are far less developed than in most members of those groups, being reduced to mere apiculations. The nature of the apex of the calyx-lobes is used by Pennell to separate section *Chrysanthae* (lobes obtuse) from section *Pallescentes* (lobes acute). Shape of apex of the calyx-lobes of *C. praeterita* varies considerably and hence is of doubtful value in relating the species to either of these two sections. The calyx-lobes of *C. praeterita* are never linear-triangular (as in most species of section *Pallescentes*), but are broader and conform more closely with section *Chrysanthae*. On the other hand, *C. praeterita* occupies ecological sites quite different from the moist meadows preferred by all species of section *Chrysanthae*: it favors drier and better drained slopes surrounding the lower portions of mountain meadows, a habitat more similar to that occupied by species of section *Pallescentes*. In view of these points of non-conformity, one might be tempted to propose a new section to accommodate *C. praeterita*, but we believe there is need for a complete re-evaluation of the sections as proposed by Pennell (1951). Noel Holmgren (1968) is in agreement with this opinion and has not given nomenclatural recognition to super-specific groupings. He suggests that the reticulate nature of species re-

relationships has resulted from speciation through hybridization between members of relatively unrelated groups. A program of artificial hybridizations currently in progress (Heckard, 1964) indicates that hybridization is indeed possible not only between quite unrelated species, but even between members of differing polyploid levels.

Our conclusion is that there are no species particularly closely related to *Castilleja praeterita*. The very short apiculate teeth of the lower corolla-lip occur in no species of either section *Chrysanthae* or *Pallescentes*. The only species which approaches this reduced condition of teeth is *C. culbertsonii* (section *Chrysanthae*), where the teeth, though still longer than those of *C. praeterita*, are reduced to about 0.5 mm in length. Despite this floral similarity, the sum of characters does not indicate a close relationship between the two species. The only other species of *Castilleja* which, to our knowledge, has the teeth of the lower lip as reduced as in *C. praeterita* is *C. cinerea* Gray. This restricted endemic of arid, sagebrush slopes at elevations above 6,000 ft. in the San Bernardino Mts. has a deeply 4-cleft calyx which places it far from *C. praeterita* and among the *Orthocarpus*-like species.

Jepson Herbarium, Botany Department, University of California, Berkeley

LITERATURE CITED

- GRAY, A. 1878. Synoptical flora of North America. Vol. 2, Part 1, New York.
- HECKARD, L. R. 1964. [Abstract.] Causes of taxonomic complexity in *Castilleja*. *Amer. J. Bot.* 51:686.
- HOLMGREN, N. H. 1968. A taxonomic revision of the *Castilleja viscidula* group. Ph.D. Thesis, Columbia University, New York.
- JEPSON, W. L. 1925. A manual of the flowering plants of California. Berkeley.
- OWNBEY, M. 1959. *Castilleja*. In C. L. Hitchcock, et al., Vascular plants of the Pacific Northwest. Vol. 4. Univ. Washington Press, Seattle.
- PENNELL, F. W. 1951. *Castilleja*. In L. R. Abrams, Illustrated flora of the Pacific States. Vol. 3. Stanford Univ. Press.
- WATSON, S. 1871. Vol. 5, Botany. In C. King, Report on the geological exploration of the Fortieth Parallel. Washington, D.C.

NOTES AND NEWS

MADROÑO. Starting with the January 1970 issue (Vol. 20, No. 5), *Madroño* will be increased to 48 pages per issue from the current 32. An increasing number of submitted papers and the recent demise of two California journals, *Leaflets of Western Botany* and the *Contributions from the Dudley Herbarium*, makes this desirable. Unfortunately, it will be necessary to increase the subscription rate to *Madroño* and the dues to the Society as follows: institutional subscriptions, \$12.00 per year and individual membership, \$8.00 per year. Student membership remains at \$4.00 per year.